CLAIMS

At least the following is claimed:

1. A method of ejecting a fluid, comprising the steps of:

heating the fluid to a lower threshold using electric heating;

heating the fluid to an upper threshold using laser energy; and

ejecting a volume of fluid after heating the fluid to the upper threshold.

2. The method of claim 1, further comprising heating the fluid to the lower threshold using electric heating immediately prior to heating the fluid to the upper threshold.

3. The method of claim 1, further comprising:

heating the fluid in nozzle systems located in a first area of a fluid ejection device to the lower threshold using an electric heating layer located in the first area;

directing laser energy from a laser system at a photon absorbing layer of selected nozzle systems in the first area; and

heating the fluid in the selected nozzle systems from the lower threshold to the upper threshold using energy absorbed by the photon absorbing layer.

4. The method of claim 3, further comprising:

heating the fluid in nozzle systems located in a second area to the lower threshold using the electric heating layer located in the second area;

directing laser energy from the laser system at a photon absorbing layer of selected nozzle systems in the second area; and

heating the fluid in the selected nozzle systems from the lower threshold to the upper threshold using energy absorbed by the photon absorbing layer.

5. The method of claim 3, further comprising:

activating the electric heating layer in each area to heat the fluid to the lower threshold in each area in a sequential manner from a first end of the page-wide array to a second end of the page-wide array;

synchronizing the emission of laser energy from the laser system with the activation of the electric heating layer;

scanning the laser from the first end to the second end of the page-wide array as the fluid in each area is sequentially heated to the lower threshold;

directing laser energy from the laser system at a photon absorbing layer of a plurality of selected nozzle systems in each area;

heating the fluid in the selected nozzle systems sequentially to the upper threshold as the laser scans across the page-wide array; and

ejecting a volume of fluid from the selected nozzle systems as the laser scans across the page-wide array.

6. The method of claim 3, wherein the electric heating layer and the photon absorbing layer comprise a same material.

7. The method of claim 3, wherein the electric heating layer and the photon absorbing layer are distinct layers.

8. A method of ejecting fluid from a page-wide array comprising a laser system operative to emit laser energy and a page-wide array comprising a plurality of areas, each area includes a plurality of nozzle systems and a heating layer, the heating layer includes an electric heating layer and a photon absorbing layer, each nozzle system includes the fluid, comprising the steps of:

heating the fluid in each area to a lower threshold using the electric heating layer corresponding to each area in a sequential manner from a first end of the page-wide array to a second end of the page-wide array;

directing laser energy from the laser system at the photon absorbing layer of a plurality of selected nozzle systems in each area beginning from the first end of the page-wide array to the second end of the page-wide array;

heating the fluid in the selected nozzle systems from the lower threshold to an upper threshold using the laser system; and

ejecting a volume of the fluid from the selected nozzle systems beginning from the first end of the page-wide array to the second end of the page-wide array.

9. The method of claim 8, further comprising:

synchronizing the emission of laser energy from the laser system with the activation of the electric heating layer.

10. A printhead, comprising:

a laser system operative to emit laser energy;

a page-wide array comprising a plurality of areas, each area includes a heating layer and a plurality of nozzle systems, the heating layer includes an electric heating layer and a photon absorbing layer, each heating component of a particular area overlaps the adjacent area, each nozzle system includes:

an orifice, a fluid chamber, and the photon absorbing layer, the fluid chamber includes a fluid, a portion of the electric heating layer is adjacent the fluid chamber and is operative to heat the fluid in the fluid chamber to the lower threshold temperature, the photon absorbing layer is adjacent the fluid chamber, the photon absorbing layer is operative to absorb laser energy emitted from the laser and heat the fluid in the fluid chamber from the lower threshold temperature to the upper threshold temperature.

11. The printhead of claim 10, wherein a fluid ejection system is operative to control the activation of the electric heating layers in a sequential manner from the first end of the page-wide array to the second end of the page-wide array, wherein the fluid ejection system is operative to control the scan rate of the laser system from the first end of the page-wide array to the second end of the page-wide array, wherein the page-wide array printing system synchronizes the activation of the electric heating layers and the scan rate of the laser system from the first end to the second end so that the fluid in the fluid chamber of a selected nozzle system is heated to the lower threshold temperature using the electric heating layer prior to the laser emitting laser energy directed to the photon absorbing layer of the selected nozzle systems.

12. The printhead of claim 10, wherein the page-wide array includes about 2000 to 8000 nozzle systems.

13. The printhead of claim 10, wherein the fluid includes black ink.

14. The printhead of claim 10, wherein the electric heating layer includes a resistive layer.

15. A printhead comprising:

a fluid chamber;

a nozzle in fluid communication with the fluid chamber to allow the fluid to be ejected from the fluid chamber;

means, responsive to an electric current, for heating the fluid in the fluid chamber to a first threshold; and

means, responsive to optical energy, for heating the fluid in the fluid chamber to a second threshold sufficient to eject ink from the fluid chamber.

16. The printhead of claim 15, comprising a plurality of fluid chambers and a plurality of nozzles associated with each fluid chamber, wherein the means responsive to the electric current heats the fluid in the plurality of fluid chambers and the means responsive to optical energy is operative to heat fluid at each nozzle.

17. The printhead of claim 15, comprising means for synchronizing the heating of the fluid in the fluid chambers to the lower threshold with the heating of the fluid from the lower threshold to the upper threshold.

18. The printhead of claim 15, comprising means for synchronizing the heating of the fluid in each fluid chamber in a sequential manner using the means responsive to the electric current with the heating of the fluid in each nozzle using the means responsive to the optical energy.

19. A printhead comprising:

a plurality of fluid chambers;

a plurality of nozzles, each associated with at least one of the plurality of fluid chambers;

a plurality of resistors, each coupled to receive electric current and corresponding to one of the plurality of fluid chambers; and

a plurality photon absorbing layers that generate heat in response to optical energy, each photon absorbing layer being coupled to the fluid chambers to eject fluid from the fluid chambers.

20. The printhead of claim 19, wherein the photon absorbing layer includes a plurality of sections each associated with a single nozzle.

21. The printhead of claim 19, further comprising a laser system operative to direct laser energy at each of the plurality of photon absorbing layers.

22. The printhead of claim 19, further comprising a print control system operative to synchronize the activation of the electric heating layers and the scan rate of the laser system to eject fluid from the fluid chambers.

23. The printhead of claim 19, wherein the plurality of resistors and plurality photon absorbing layers are substantially coplanar with each other.

24. The printhead of claim 19, wherein the plurality of resistors and plurality photon absorbing layers each form distinct layers.

25. The printhead of claim 24, wherein the plurality of resistors are each adjacent to one of the plurality of fluid chambers and wherein the plurality of photon absorbing layers are separated from the fluid ejection chambers by the plurality of resistors.